CLAIMS

I/we claim:

[c1] An apparatus for detecting characteristics of a microelectronic substrate having a first surface with first topographical features and a second surface facing opposite from the first surface and having second topographical features, the apparatus comprising:

a support member configured to carry the microelectronic substrate with a first portion of the first surface exposed and a second portion of the second surface exposed; and

a topographical feature detector positioned proximate to the support member and aligned with the first portion of the first surface of the microelectronic substrate, the topographical feature detector including a non-capacitive detection device configured to detect roughness characteristics of the first surface when the microelectronic substrate is carried by the support member.

[c2] The apparatus of claim 1 wherein the topographical feature detector is configured to:

determine distances from a reference plane to a plurality of the first topographical features;

select from the determined distances a minimum distance value;

select from the determined distances a maximum distance value; and

subtract the minimum distance value from the maximum distance value.

[c3] The apparatus of claim 1 wherein the second topographical features include conductive structures protruding from the second surface, and wherein the topographical feature detector is a first topographical feature detector, and wherein the apparatus further comprises a second topographical feature detector

positioned proximate to the support member and configured to detect a characteristic of the second topographical features when the microelectronic substrate is supported by the support member.

[c4] The apparatus of claim 1 wherein at least one of the topographical feature detector and the support member is movable relative to the other while the microelectronic substrate is carried by the support member.

[c5] The apparatus of claim 1 wherein the topographical feature detector includes of a first system configured to detect roughness features of microelectronic substrates having a first range of thicknesses, the first system being interchangeable with a second system configured to detect roughness features of microelectronic substrates having a second range of thicknesses, with a maximum thickness of the second range being greater than a maximum thickness of the first range.

[c6] The apparatus of claim 1 wherein the second topographical feature includes a solder bump, and wherein the apparatus further comprises a raised feature detector positioned proximate to the support member and configured to detect a characteristic of the solder bump.

[c7] The apparatus of claim 1 wherein the second topographical feature includes a gold bump, and wherein the apparatus further comprises a feature detector positioned proximate to the support member and configured to detect a characteristic of the gold bump.

[c8] The apparatus of claim 1, further comprising:

a first camera positioned proximate to the support member and configured to detect at least one of a position, a surface defect and a bridge of at least one of the second topographical features of the microelectronic substrate when the microelectronic substrate is supported by the support member; and

a second camera positioned proximate to the support member and configured to detect a height of at least one of the second topographical features of the microelectronic substrate when the microelectronic substrate is supported by the support member.

[c9] The apparatus of claim 1 wherein the support member has a contact surface with a plurality of apertures, the apertures being coupleable to a vacuum source to draw the microelectronic substrate into contact with the support member.

[c10] The apparatus of claim 1 wherein the support member has a generally ring-shaped contact surface, and wherein the first portion of the first surface of the microelectronic substrate is disposed annularly inwardly from the contact surface when the support member carries the microelectronic substrate.

[c11] The apparatus of claim 1 wherein the topographical feature detector includes a probe having a contact portion configured to contact the microelectronic substrate, the topographical feature detector being configured to detect a roughness of the microelectronic substrate based on measurements at a plurality of locations on the microelectronic substrate.

[c12] The apparatus of claim 1 wherein the topographical feature detector includes a radiation receiver positioned to receive radiation reflected from the microelectronic substrate, the topographical feature detector being configured to detect a roughness of the microelectronic substrate based on measurements at a plurality of locations on the microelectronic substrate.

[c13] The apparatus of claim 1 wherein the topography detector includes a laser beam emitter positioned to direct radiation toward the microelectronic substrate, the topography detector further including a laser beam receiver positioned to receive radiation reflected from the microelectronic substrate, the topography detector being configured to detect a roughness of the microelectronic substrate

based on measurements at a plurality of locations on the microelectronic substrate.

[c14] An apparatus for detecting characteristics of a microelectronic substrate having a first surface with first topographical features that do not include conductive connection structures, and a second surface facing opposite from the first surface and having second topographical features, the second topographical features including conductive structures protruding from the second surface, the apparatus comprising:

a support member configured to carry the microelectronic substrate with a first portion of the first surface exposed and a second portion of the second surface exposed; and

a topographical feature detector positioned proximate to the support member and aligned with the first portion of the first surface of the microelectronic substrate, the topographical feature detector including at least one of a contact probe and a radiation receiver positioned to detect characteristics of the first topographical features while the microelectronic substrate is carried by the support member without contacting the conductive structures protruding from the second portion of the second surface.

[c15] The apparatus of claim 14 wherein the topographical feature detector is configured to:

determine distances from a reference plane to a plurality of roughness features;

select from the determined distances a minimum distance value;

select from the determined distances a maximum distance value; and

subtract the minimum distance value from the maximum distance value.

[c16] The apparatus of claim 14 wherein the topographical feature detector is a first topographical feature detector, and wherein the apparatus further comprises

a second topographical feature detector positioned proximate to the support member and configured to detect a characteristic of the second topographical features when the microelectronic substrate is supported by the support member.

[c17] An apparatus for detecting characteristics of a microelectronic substrate having a first surface with first topographical features that do not include conductive connection structures, and a second surface facing opposite from the first surface and having second topographical features, the second topographical features including conductive structures protruding from the second surface, the apparatus comprising:

a support member configured to carry the microelectronic substrate with a first portion of the first surface exposed and a second portion of the second surface exposed;

a first topographical feature detector positioned proximate to the support member and aligned with the first portion of the first surface of the microelectronic substrate when the microelectronic substrate is carried by the support member to detect characteristics of the first topographical features, the first topographical feature detector including at least one of a contact probe positioned to contact the first surface and a radiation receiver positioned to receive radiation reflected from the first surface; and

a second topographical feature detector positioned proximate to the support member and aligned with the second portion of the second surface of the microelectronic substrate when the microelectronic substrate is carried by the support member to detect characteristics of the conductive structures protruding from the second surface.

[c18] The apparatus of claim 17 wherein the first topographical feature detector is configured to:

determine distances from a reference plane to a plurality of the first topographical features;

select from the determined distances a minimum distance value;

select from the determined distances a maximum distance value; and

subtract the minimum distance value from the maximum distance value to determine a thickness variation for the microelectronic substrate.

[c19] The apparatus of claim 17 wherein the first topographical feature detector includes a first system configured to detect roughness features of microelectronic substrates having a first range of thicknesses, interchangeable with a second system configured to detect roughness features of microelectronic substrates having a second range of thicknesses different than the first range of thicknesses.

[c20] The apparatus of claim 17 wherein the second topographical feature detector includes:

a first camera positioned proximate to the support member and configured to detect at least one of a position, a surface defect and a bridge of at least one of the second topographical features of the microelectronic substrate when the microelectronic substrate is supported by the support member; and

a second camera positioned proximate to the support member and configured to detect a height of at least one of the second topographical features of the microelectronic substrate when the microelectronic substrate is supported by the support member.

[c21] The apparatus of claim 17 wherein the support member has a contact surface with a plurality of apertures, the apertures being coupleable to a vacuum source to draw the microelectronic substrate into contact with the support member.

[c22] The apparatus of claim 17 wherein the support member has a generally ring-shaped contact surface, and wherein the first portion of the first surface is disposed annularly inwardly from the contact surface when the support member carries the microelectronic substrate.

[c23] The apparatus of claim 17 wherein the first topographical feature detector includes a probe having a contact portion configured to contact the microelectronic substrate, the first topographical feature detector being configured to detect a roughness of the microelectronic substrate based on measurements at a plurality of locations on the microelectronic substrate.

[c24] The apparatus of claim 17 wherein the first topographical feature detector includes a radiation emitter positioned to direct radiation toward the microelectronic substrate, the first topographical feature detector further including a radiation receiver positioned to receive radiation reflected from the microelectronic substrate, the first topographical feature detector being configured to detect a roughness of the microelectronic substrate based on measurements at a plurality of locations on the microelectronic substrate.

[c25] An apparatus for detecting characteristics of a microelectronic substrate having a first surface with roughness features and a second surface facing opposite from the first surface and having raised conductive features, the apparatus comprising:

a support member having a contact surface configured to contact the first surface of the microelectronic substrate, the support member being shaped to leave a first portion of the first surface exposed and a second portion of the second surface exposed when the microelectronic substrate contacts the support member;

a roughness detector that includes a probe having a contact portion configured to contact the microelectronic substrate, the roughness detector being configured to detect a roughness of the microelectronic substrate based on measurements at a plurality of locations on the first surface of the microelectronic substrate; and

an actuator coupled to at least one of the roughness detector and the support member to move at least one of the roughness detector and

the support member relative to the other while the support member supports the microelectronic substrate.

[c26] The apparatus of claim 25 wherein the contact surface has apertures coupleable to a vacuum source to draw the microelectronic substrate toward the support member.

[c27] The apparatus of claim 25 wherein the roughness detector is configured to:

determine distances from a reference plane to a plurality of the roughness features on the first surface of the microelectronic substrate;

select from the determined distances a minimum distance value;

select from the determined distances a maximum distance value; and

subtract the minimum distance value from the maximum distance value.

[c28] The apparatus of claim 25 wherein the roughness detector includes a first system configured to detect roughness features of microelectronic substrates having a first range of thicknesses, interchangeable with a second system configured to detect roughness features of microelectronic substrates having a second range of thicknesses different than the first range of thicknesses.

[c29] The apparatus of claim 25 wherein the raised conductive features include solder bumps and/or gold bumps, and wherein the apparatus further comprises a raised feature detector positioned proximate to the support member and configured to detect a characteristic of the solder bumps and/or gold bumps.

[c30] The apparatus of claim 25, further comprising:

a first camera positioned proximate to the support member and configured to detect at least one of a position, a surface defect and a bridge of at least one of the raised conductive features of the microelectronic substrate when the microelectronic substrate is supported by the support member; and

a second camera positioned proximate to the support member and configured to detect a height of at least one of the raised conductive features of the microelectronic substrate when the microelectronic substrate is supported by the support member.

[c31] The apparatus of claim 25 wherein the support member has a generally ring-shaped contact surface, and wherein the first portion of the first surface is disposed annularly inwardly from the contact surface when the support member carries the microelectronic substrate.

[c32] An apparatus for detecting characteristics of a microelectronic substrate having a first surface with roughness features and a second surface facing opposite from the first surface and having raised conductive features, the apparatus comprising:

a support member having a contact surface configured to contact the first surface of the microelectronic substrate, the support member being shaped to leave a first portion of the first surface and a second portion of the second surface exposed when the microelectronic substrate contacts the support member;

a roughness detector that includes a radiation receiver positioned to receive radiation reflected from the first surface of the microelectronic substrate, the roughness detector being configured to detect a roughness of the microelectronic substrate based on measurements at a plurality of locations on the first surface of the microelectronic substrate; and

an actuator coupled to at least one of the roughness detector and the support member to move at least one of the roughness detector and the support member relative to the other while the support member supports the microelectronic substrate.

[c33] The apparatus of claim 32 wherein the contact surface has apertures coupleable to a vacuum source to draw the microelectronic substrate into contact with the support member.

[c34] The apparatus of claim 32 wherein the roughness detector includes a radiation emitter is configured to emit laser radiation and a radiation receiver configured to receive laser radiation.

[c35] The apparatus of claim 32 wherein the roughness detector is configured to:

determine distances from a reference plane to a plurality of the roughness features on the first surface of the microelectronic substrate;

select from the determined distances a minimum distance value;

select from the determined distances a maximum distance value; and

subtract the minimum distance value from the maximum distance value.

[c36] The apparatus of claim 32, further comprising:

a first camera positioned proximate to the support member and configured to detect at least one of a position, a surface defect and a bridge of at least one of the raised conductive features of the microelectronic substrate when the microelectronic substrate is supported by the support member; and

a second camera positioned proximate to the support member and configured to detect a height of at least one of the raised conductive features of the microelectronic substrate when the microelectronic substrate is supported by the support member.

[c37] The apparatus of claim 32 wherein the support member has a generally ring-shaped contact surface, and wherein the first portion of the first surface is disposed annularly inwardly from the contact surface when the support member carries the microelectronic substrate.

[c38] An apparatus for detecting characteristics of a microelectronic substrate having a first surface with roughness features and a second surface facing opposite from the first surface and having raised conductive features, the apparatus comprising:

a generally ring-shaped support member;

a contact surface on the support member, the contact surface being configured to contact the first surface of the microelectronic substrate with a first portion of the first surface exposed and a second portion of the second surface exposed;

a roughness detector positioned proximate to the support member;

the roughness detector being and aligned with the first portion of the first surface of the microelectronic substrate when the microelectronic substrate is carried by the support member;

the roughness detector including at least one of a contact probe configured to contact the first surface, and a remote detector configured to receive radiation reflected from the first surface;

wherein at least one of the roughness detector and the support member is movable relative to the other while the microelectronic substrate is carried by the support member, and wherein the apparatus further comprises;

a first feature detector positioned proximate to the second surface of the microelectronic substrate to detect at least one of a diameter, position, and surface characteristic of the raised conductive features when the microelectronic substrate is carried by the support member; and

a second feature detector positioned proximate to the second surface of the microelectronic substrate to detect a height of the raised conductive features relative to the second surface when the microelectronic substrate is carried by the support member.

[c39] The apparatus of claim 38 wherein the raised conductive features include solder bumps and/or gold bumps, and wherein the first and second feature detectors are configured to detect characteristics of the solder bumps and/or gold bumps.

[c40] An apparatus for detecting characteristics of a microelectronic substrate having a first surface with first topographical features that include roughness elements, and a second surface facing opposite from the first surface and having second topographical features that include raised conductive structures, the apparatus comprising:

support means configured to carry the microelectronic substrate with a first portion of the first surface exposed and a second portion of the second surface exposed;

first topography detection means positioned proximate to the support member and aligned with the first portion of the first surface of the microelectronic substrate to detect at least one or a roughness and a thickness variation of the first surface when the microelectronic substrate is carried by the support member, the first topography detection means including at least one of a contact probe positioned to contact the first surface and a radiation receiver positioned to receive radiation reflected from the first surface; and

second topography detection means positioned proximate to the support member and aligned with the second portion of the second surface to detect a characteristic of the raised conductive structures when the microelectronic substrate is carried by the support means.

[c41] The apparatus of claim 40, further comprising actuator means operatively coupled to at least one of the first topography detection means and the support means to move at least one of the first topography detection means and the support means relative to the other while the microelectronic substrate is carried by the support means.

[c42] The apparatus of claim 40 wherein the first topography detection means is configured to:

determine distances from a reference plane to a plurality of roughness features of the microelectronic substrate;

select from the determined distances a minimum distance value;

select from the determined distances a maximum distance value; and

subtract the minimum distance value from the maximum distance value.

[c43] The apparatus of claim 40 wherein the first topography detection means includes a first system configured to detect roughness features of microelectronic substrates having a first range of thicknesses, interchangeable with a second system configured to detect roughness features of microelectronic substrates having a second range of thicknesses different than the first range of thicknesses.

[c44] The apparatus of claim 40 wherein the second topography detection means includes:

a first camera positioned proximate to the support means and configured to detect at least one of a position, a surface defect and a bridge of at least one of the second topographical features of the microelectronic substrate when the microelectronic substrate is supported by the support means; and

a second camera positioned proximate to the support means and configured to detect a height of at least one of the second topographical features of the microelectronic substrate when the microelectronic substrate is supported by the support means.

[c45] The apparatus of claim 38 wherein the support means has a contact surface with a plurality of apertures, the apertures being coupleable to a vacuum source to draw the microelectronic substrate into contact with the support member.

[c46] The apparatus of claim 38 wherein the support means has a generally ring-shaped contact surface, and wherein the first portion of the first surface is disposed annularly inwardly from the contact surface when the support member carries the microelectronic substrate.

[c47] The apparatus of claim 38 wherein the first topography detection means includes a probe having a contact portion configured to contact the first surface of the microelectronic substrate, the first topography detection means being configured to detect a roughness of the first surface based on measurements at a plurality of locations on the first surface.

[c48] The apparatus of claim 38 wherein the first topography detection means includes a radiation receiver positioned to receive radiation reflected from the first surface, the first topography detection means being configured to detect a roughness of the first surface based on measurements at a plurality of locations on the first surface.

[c49] A method for processing a microelectronic substrate, comprising:

forming first topographical features on or in a first surface of the microelectronic substrate, the first topographical features including roughness features but not including electrical connection structures offset from the first surface;

forming second topographical features on or in a second surface of the microelectronic substrate facing opposite from the first surface, the second topographical features including conductive structures protruding from the second surface;

supporting the microelectronic substrate while a first portion of the first surface is exposed and a second portion of the second surface is exposed; and

detecting a characteristic of the first topographical features by positioning a topographical detection device at least proximate to the first portion

of the first surface and activating the topographical detection device while the first portion of the first surface is exposed and while the second portion of the second surface is exposed with the conductive structures protruding from the second surface.

[c50] The method of claim 49 wherein detecting a characteristic of the first topographical features includes detecting a roughness of the first portion of the first surface by positioning a roughness detection device at least proximate to the first portion and activating the roughness detection device while the first portion of the first surface is exposed.

[c51] The method of claim 49 wherein detecting a characteristic of the first portion includes receiving radiation reflected from the first portion.

[c52] The method of claim 49 wherein supporting the microelectronic substrate includes carrying the microelectronic substrate with a support member, and wherein the method further comprises detecting a characteristic of at least one of the second topographical features while carrying the microelectronic substrate with the support member.

[c53] The method of claim 49, further comprising moving at least one of the microelectronic substrate and the topographical detection device relative to the other while the first portion of the first surface is exposed.

[c54] The method of claim 49, further comprising determining a thickness variation for the microelectronic substrate by:

establishing a reference plane;

determining distances from the reference plane to a plurality of roughness features of the first surface;

selecting from the determined distances a minimum distance value;

selecting from the determined distances a maximum distance value; and

subtracting the minimum distance value from the maximum distance value.

[c55] The method of claim 49 wherein supporting the microelectronic substrate includes positioning the microelectronic substrate on a generally ring-shaped support surface with the first portion of the first surface positioned radially inward from the support surface.

[c56] The method of claim 49 wherein supporting the microelectronic substrate includes forcing the microelectronic substrate into contact with a support member.

[c57] The method of claim 47 wherein supporting the microelectronic substrate includes applying a vacuum to the microelectronic substrate to draw the microelectronic substrate into contact with a support member.

[c58] The method of claim 47, further comprising detecting at least one of a position, a surface defect, and a bridge of at least one of the second topographical features while supporting the microelectronic substrate with the first portion of the first surface exposed and the second portion of the second surface exposed.

[c59] The method of claim 49, further comprising detecting a height of at least one of the second topographical features of the microelectronic substrate while supporting the microelectronic substrate with the first portion of the first surface exposed and the second portion of the second surface exposed.

[c60] The method of claim 49, further comprising detecting a characteristic of at least one of the second topographical features by directing laser radiation toward the microelectronic substrate and receiving radiation reflected from the microelectronic substrate while the first portion of the first surface is exposed and the second portion of the second surface is exposed.

[c61] The method of claim 49, further comprising removing material from the first surface of the microelectronic before, after, or both before and after detecting a characteristic of the first topographical features.

[c62] The method of claim 49, further comprising:

removing a first portion of material from the first surface of the microelectronic substrate prior to detecting a characteristic of the first topographical features; and

removing a second portion of material from the first surface of the microelectronic substrate after detecting a characteristic of the first topographical features.

[c63] A method for detecting characteristics of a microelectronic substrate having a first surface with first topographical features that do not include conductive connection structures, and a second surface facing opposite from the first surface and having second topographical features, the method comprising:

supporting the microelectronic substrate while at least a first portion of the first surface is exposed and at least a second portion of the second surface is exposed; and

detecting a roughness of the first surface by positioning a topographical detection device at least proximate to the first topographical features of the first surface and activating the topographical detection device to receive feedback from the first topographical features while the first portion of the first surface and the second portion of the second surface are exposed.

[c64] The method of claim 63 wherein detecting a roughness of the first surface includes contacting a probe with the first portion of the first surface to determine a roughness of the first portion.

[c65] The method of claim 63 wherein detecting a roughness of the first surface includes receiving radiation reflected from the first portion.

[c66] The method of claim 63 wherein supporting the microelectronic substrate includes carrying the microelectronic substrate with a support member, and wherein the method further comprises detecting a characteristic of at least one of

the second topographical features while carrying the microelectronic substrate with the support member.

[c67] The method of claim 63, further comprising moving at least one of the microelectronic substrate and the topographical detection device relative to the other while the first portion of the first surface is exposed.

[c68] The method of claim 63, further comprising determining a thickness variation for the microelectronic substrate by:

establishing a reference plane;

determining distances from the reference plane to a plurality of roughness features of the first surface;

selecting from the determined distances a minimum distance value;

selecting from the determined distances a maximum distance value; and

subtracting the minimum distance value from the maximum distance value.

[c69] The method of claim 63 wherein supporting the microelectronic substrate includes positioning the microelectronic substrate on a generally ring-shaped support surface with the first portion of the first surface positioned radially inwardly from the support surface.

[c70] The method of claim 63 wherein supporting the microelectronic substrate includes forcing the microelectronic substrate into contact with a support member.

[c71] The method of claim 63 wherein supporting the microelectronic substrate includes applying a vacuum to the microelectronic substrate to draw the microelectronic substrate into contact with a support member.

[c72] The method of claim 63, further comprising detecting a characteristic of at least one of the second topographical features while supporting the microelectronic substrate with the first portion of the first surface exposed and the second portion of the second surface exposed.

[c73] The method of claim 63, further comprising detecting at least one of a position, a surface defect, and a bridge of at least one of the second topographical features while supporting the microelectronic substrate with the first portion of the first surface exposed and the second portion of the second surface exposed.

[c74] The method of claim 63, further comprising detecting a height of at least one of the second topographical features of the microelectronic substrate while supporting the microelectronic substrate with the first portion of the first surface exposed and the second portion of the second surface exposed.

[c75] The method of claim 63, further comprising detecting a characteristic of at least one of the second topographical features by directing laser radiation toward the microelectronic substrate and receiving radiation reflected from the microelectronic substrate while the first portion of the first surface is exposed and the second portion of the second surface is exposed.

[c76] The method of claim 63, further comprising removing material from the first surface of the microelectronic before, after, or both before and after detecting a characteristic of the first topographical features.

[c77] The method of claim 63, further comprising:

removing a first portion of material from the first surface of the microelectronic substrate prior to detecting a characteristic of the first topographical features; and

removing a second portion of material from the first surface of the microelectronic substrate after detecting a characteristic of the first topographical features.

[c78] A method in a computer for detecting characteristics of a microelectronic substrate having a first surface with roughness features and a second surface facing opposite from the first surface, the method comprising:

receiving a plurality of measurements for distances between a reference plane and a corresponding plurality of the roughness features of the first surface of the microelectronic substrate;

selecting a minimum distance value from the plurality of distance values;

selecting a maximum distance value from the plurality of distance values; and

determining a thickness variation for the microelectronic substrate by subtracting the minimum distance value from the maximum distance value.

[c79] The method of claim 78, further comprising determining a roughness value for the microelectronic substrate from the plurality of distance measurements.

[c80] The method of claim 78 wherein receiving the plurality of distance measurements includes receiving a plurality of distance measurements made by a probe that contacts the microelectronic substrate.

[c81] The method of claim 78 wherein receiving the plurality of distance measurements includes receiving a plurality of distance measurements from a device that receives radiation reflected from the microelectronic substrate.

[c82] A method for detecting characteristics of a microelectronic substrate having a first surface with roughness features and a second surface facing opposite from the first surface and having protruding conductive features, the method comprising:

supporting the microelectronic substrate with a first portion of the first surface exposed and a second portion of the second surface exposed; and

detecting a roughness of the first portion of the first surface by contacting a probe with the first portion and moving at least one of the probe and the microelectronic substrate relative to the other while the first

portion of the first surface is exposed and the second portion of the second surface is exposed.

[c83] The method of claim 82 wherein supporting the microelectronic substrate includes carrying the microelectronic substrate with a support member, and wherein the method further comprises detecting a characteristic of at least one of the protruding conductive features while carrying the microelectronic substrate with the support member.

[c84] The method of claim 82, further comprising determining a thickness variation for the microelectronic substrate by:

establishing a reference plane;

determining distances from the reference plane to a plurality of roughness features of the first surface;

selecting from the determined distances a minimum distance value;

selecting from the determined distances a maximum distance value; and

subtracting the minimum distance value from the maximum distance value.

[c85] The method of claim 82 wherein supporting the microelectronic substrate includes positioning the microelectronic substrate on a generally ring-shaped support surface with the first portion of the first surface positioned radially inwardly from the support surface.

[c86] The method of claim 82 wherein supporting the microelectronic substrate includes applying a vacuum to the microelectronic substrate to draw the microelectronic substrate into contact with a support member.

[c87] The method of claim 82, further comprising:

removing a first portion of material from the first surface of the microelectronic substrate prior to detecting a characteristic of the first topographical features; and

removing a second portion of material from the first surface of the microelectronic substrate after detecting a characteristic of the first topographical features.

[c88] A method for detecting characteristics of a microelectronic substrate having a first surface with roughness features and a second surface facing opposite from the first surface and having protruding conductive features, the method comprising:

supporting the microelectronic substrate with a first portion of the first surface exposed and a second portion of the second surface exposed; and

detecting a roughness of the first portion of the first surface by directing radiation toward the microelectronic substrate, receiving radiation reflected from the microelectronic substrate at a radiation receives, and moving at least one of the receiver and the microelectronic substrate relative to the other while the first portion of the first surface is exposed and the second portion of the second surface is exposed.

[c89] The method of claim 88 wherein supporting the microelectronic substrate includes carrying the microelectronic substrate with a support member, and wherein the method further comprises detecting a characteristic of at least one of the protruding conductive features while carrying the microelectronic substrate with the support member.

[c90] The method of claim 88, further comprising determining a thickness variation for the microelectronic substrate by:

establishing a reference plane;

determining distances from the reference plane to plurality of roughness features of the first surface;

selecting from the determined distances a minimum distance value;

selecting from the determined distances a maximum distance value; and

subtracting the minimum distance value from the maximum distance value.

[c91] The method of claim 88 wherein supporting the microelectronic substrate includes positioning the microelectronic substrate on a generally ring-shaped support surface with the first portion of the first surface positioned radially inwardly from the support surface.

[c92] The method of claim 88 wherein supporting the microelectronic substrate includes applying a vacuum to the microelectronic substrate to draw the microelectronic substrate into contact with a support member.

[c93] The method of claim 88, further comprising:

removing a first portion of material from the first surface of the microelectronic substrate prior to detecting a roughness of the first surface; and

removing a second portion of material from the first surface of the microelectronic substrate after detecting a roughness of the first surface.

[c94] A method for detecting characteristics of a microelectronic substrate having a first surface with roughness features and a second surface facing opposite from the first surface and having protruding conductive features, the method comprising:

supporting the microelectronic substrate by carrying the microelectronic substrate with a support member while a first portion of the first surface is exposed and a second portion of the second surface is exposed;

detecting a roughness of the first portion of the first surface by positioning a roughness detection device at least proximate to the first portion and moving at least one of the detection device and the microelectronic substrate relative to the other while the first portion

of the first surface is exposed and the second portion of the second surface is exposed; and

detecting a characteristic of at least one of the protruding conductive features while the microelectronic substrate is carried by the support member.

[c95] The method of claim 94, further comprising determining a thickness variation for the microelectronic substrate by:

establishing a reference plane;

determining distances from the reference plane to a plurality of roughness features of the first surface;

selecting from the determined distances a minimum distance value;

selecting from the determined distances a maximum distance value; and

subtracting the minimum distance value from the maximum distance value.

[c96] The method of claim 94, further comprising detecting a characteristic of at least one of the protruding conductive features with a camera while the first portion of the first surface is exposed and the second portion of the second surface is exposed.

[c97] The method of claim 94, further comprising:

removing a first portion of material from the first surface of the microelectronic substrate prior to detecting a roughness of the first surface; and

removing a second portion of material from the first surface of the microelectronic substrate after detecting a roughness of the first surface.